

RECENT PROGRESS in the Consideration of Flavoring Ingredients Under the Food Additives Amendment

6. GRAS Substances

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□ IN KEEPING with previously outlined policies of the Flavor and Extract Manufacturers' Association, this paper reports the latest results of evaluations of GRAS (Generally Recognized as Safe) status of a number of substances.

These evaluations were carried out by an independent panel of experts chosen as described before (Hall and Oser, 1961) and consisting of: Dr. Anthony M. Ambrose, Medical College of Virginia; Dr. Horace W. Gerarde, B-D Laboratories; Dr. Maurice H. Seevers, University of Michigan; Dr. Howard C. Spencer, Dow Chemical Co.; Dr. Frank Strong, University of Wis-

consin; Dr. Lauren A. Woods, Virginia Commonwealth University.

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The authors acknowledge the valuable assistance of Mona Oser in reviewing the table in this article.

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SURVEY OF FLAVORING INGREDIENT USAGE LEVELS

Flavor and Extract Manufacturers' Association average maximum levels (in ppm) on which the Expert Panel based its judgments that the substances are generally recognized as safe for their intended uses.

| FEMA No. and Substance | Bever- ages | Ice Cream, Ices, etc. | Candy | Baked Goods | Gelatins & Puddings | Chewing Gum | Meat, Meat Sauces, Soups | Milk, Dairy Products | Condi- ments, Pickles | Other Use Categories |
|--|----------------|--------------------------|-------|----------------|---------------------|----------------|-----------------------------------|----------------------------|-----------------------------|--------------------------|
| 3326 ACETONE | 5 | 5 | 8 | 8 | 5 | — | — | — | — | Preserves & Spreads—5 |
| Acetoyl butyrate (see 3332) | | | | | | | | | | |
| Acetylacetaldehyde, dimethyl acetal (see 3381) | | | | | | | | | | |
| 3327 2- ACETYL-3,5 (and 6)— DIMETHYLPYRAZINE | — | 1 | 5 | 5 | 1 | — | 5 | — | — | Cereals—5 |
| 3328 2-ACETYL THIAZOLE | 0.2 | 0.9 | 1.4 | — | — | 0.6 | — | — | — | Protein foods—0.7 |
| 3329 ALLYL THIOPROPIONATE Azole (see 3386) | — | — | — | 0.25 | — | — | 0.25 | — | 0.25 | |
| 3330 BENZYL TRANS-2- METHYL-2-BUTENOATE Benzyl tiglate (see 3330) | — | — | — | 8 | — | — | — | — | 8 | |

| FEMA No. and Substance | Beverages | Ice Cream, Ices, etc. | Candy | Baked Goods | Gelatins & Puddings | Chewing Gum | Meat, Meat Sauces, Soups | Milk, Dairy Products | Condiments, Pickles | Other Use Categories |
|---|-----------|-----------------------|-------|-------------|---------------------|-------------|--------------------------|----------------------|---------------------|---|
| 3331 BISBOLENE | 3 | 3 | 5 | 5 | 3 | — | — | — | — | Preserves & Spreads—3; Alcoholic Beverages—3 |
| 3332 BUTAN-3-ONE-2-YL BUTANOATE | 5 | 25 | 50 | 75 | 30 | — | — | — | — | Alcoholic Beverages—25 |
| 3333 3-BUTYLIDENEPHTHALIDE | — | — | — | 8 | — | — | 5 | — | 5 | |
| 3334 3-N-BUTYLPHTHALIDE | — | — | — | — | 2 | — | 1 | — | 2 | Preserves & Spreads—2; Alcoholic Beverages—0.5 |
| 2-sec Butyl thiazole (see 3372) | | | | | | | | | | |
| p-Cresyl isovalerate (see 3387) | | | | | | | | | | |
| 3335 DI-(BUTAN-3-ONE-1-YL) SULFIDE | 1 | 1 | 2 | 2 | 2 | — | — | — | — | 1 |
| 3336 2,3-DIETHYL-5-METHYLPYRAZINE | 0.1 | 0.2 | 0.5 | 1.0 | 0.2 | — | 0.2 | — | — | Cereals—1 |
| 3337 DIFURFURYL ETHER | — | — | — | 1 | — | — | 1 | — | — | |
| 3338 5,7-DIHYDRO-2-METHYLTHIENO (3,4-D) PYRIMIDINE | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Cereals—1 |
| 1,1-Diisobutoxy-2-phenylethane (see 3384) | | | | | | | | | | |
| Dimethyl ketone (see 3326) | | | | | | | | | | |
| 3339 3,7-DIMETHYLOCTA-2, 6-DIENYL 2-ETHYLBUTANOATE | 10 | 40 | 75 | 100 | 50 | — | — | — | — | Preserves & Spreads—50; Alcoholic Beverages—40 |
| Divinyleneimine (see 3386) | | | | | | | | | | |
| 3340 2-ETHOXYTHIAZOLE | — | 0.2 | 1 | 1 | — | — | 0.5 | — | — | Cereal—2 |
| Ethyl 2-ethylidihydrocinnamate (see 3341) | | | | | | | | | | |
| 3341 ETHYL 2-ETHYL-3-PHENLYPROPANOATE | 5 | 5 | 50 | — | — | — | — | — | — | Preserves & Spreads—50; Alcoholic Beverages—25 |
| 3342 ETHYL 3-HEXENOATE | 2 | 2 | 4 | 4 | 2 | — | — | — | — | Preserves, Spreads, etc.—2 |
| 3343 ETHYL 3-METHYLTHIOPROPIONATE | 1 | 1 | 2 | 2 | 1 | — | — | — | — | Preserves & Spreads—1 |
| 3344 ETHYL CIS-4-OCTENOATE | 3 | 3 | 5 | 5 | 3 | — | — | — | — | Preserves, Spreads, etc.—3 |
| 2-Ethylphenylmercaptan (see 3345) | | | | | | | | | | |
| Ethyl propyl carbinol (see 3351) | | | | | | | | | | |
| Ethyl-2-thiazoyl ether (see 3340) | | | | | | | | | | |
| 3345 2-ETHYLTHIOPHENOL | 0.2 | 0.2 | 0.3 | 0.3 | 0.2 | — | 0.2 | — | — | |
| Ethyl vinylketone (see 3382) | | | | | | | | | | |
| Fenchyl acetate (see 3390) | | | | | | | | | | |
| Furfuryl ether (see 3337) | | | | | | | | | | |
| 3346 FURFURYL PROPIONATE | 0.5 | 0.5 | 1 | 1 | 1 | 1 | 1 | — | — | Cereal—1 |
| 3347 FURFURYL THIOPROPIONATE | 1 | 1 | 1 | 1 | — | — | — | — | — | |
| Geranyl 2-ethylbutyrate (see 3339) | | | | | | | | | | |
| 3348 HEPTANOIC ACID | 2 | 2 | 6 | 8 | 6 | — | — | — | — | Preserves & Spreads—2; Margarine—6 |

6. GRAS Substances

| FEMA No. and Substance | Beverages | Ice Cream, Ices, etc. | Candy | Baked Goods | Gelatins & Puddings | Chewing Gum | Meat, Meat Sauces, Soups | Milk, Dairy Products | Condiments, Pickles | Other Use Categories |
|--|-----------|-----------------------|-------|-------------|---------------------|-------------|--------------------------|----------------------|---------------------|-----------------------------|
| 3349 4-HEPTENAL DIETHYL ACETAL | 1 | — | 1 | 1 | — | — | 1 | 1 | — | Cereal—1 |
| 3350 3-HEPTYL-5-METHYL-2 (3H) FURANONE <i>α</i> -D- Heptyl-γ-valerolactone (see 3350) | — | — | — | — | — | 1.5 | 1.5 | 1.5 | — | |
| 3351 3-HEXANOL | 1 | 1 | 2 | 2 | 1 | — | — | — | — | Preserves & Spreads—1 |
| 3352 4-HEXENE-3-ONE | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Cereals—1 |
| 3353 3-HEXENYL FORMATE 3-Hexenyl methanoate (see 3353) | 1 | 1 | 1 | 2 | 2 | 1 | — | — | — | Preserves & Spreads—1 |
| 3354 N-HEXYL 2-BUTENOATE Hexyl crotonate (see 3354) 6-Hydroxy-3, 7-dimethyl-caprylic acid, lactone (see 3355) | 8 | 8 | 10 | 10 | 8 | — | — | — | — | Preserves—8 |
| 3355 6-HYDROXY-3,7-DIMETHYLOCTANOIC ACID LACTONE | 300 | 200 | 200 | 500 | 500 | — | — | — | — | Syrups—1000 |
| 3356 HYDROXYNONANOIC ACID, Δ-LACTONE | 2 | 2 | 4 | 4 | 2 | — | — | — | — | Preserves—2; Margarine—2 |
| Imidole (see 3386) | | | | | | | | | | |
| Isobutyl isovalerate (see 3369) | | | | | | | | | | |
| 2-Isobutylpyridine (see 3370) | | | | | | | | | | |
| 3-Isobutylpyridine (see 3371) | | | | | | | | | | |
| Isopropylidene acetone see 3368) | | | | | | | | | | |
| 3357 2-KETO-4-BUTANETHIOL 3-Ketobutyraldehyde, dimethyl acetal (see 3381) Linoleic and linolenic acids (see 3380) Mesityl oxide (see 3368) Methyl isobutenyl ketone (see 3368) 4-Mercapto-2-butanone (see 3357) | — | — | — | 0.20 | — | — | 0.20 | — | — | |
| 3358 2-METHOXY-3(5 AND 6)-ISOPROPYLPYRAZINE | — | — | — | — | 0.05 | — | 0.2 | — | 0.2 | Olives, Relishes—0.05 |
| 3359 2-METHYLBUTYL 2-METHYLBUTYRATE Methyl citronellate (see 3361) | 5 | 5 | 8 | 8 | 5 | — | — | — | — | Preserves—5 |
| 3360 3-METHYL-2-CYCLOHEXEN-ONE | 0.03 | 0.05 | 0.08 | 0.15 | 0.05 | — | — | 0.02 | — | |
| 3361 METHYL 3,7-DIMETHYL-6-OCTENOATE | 1.5 | — | — | 3 | — | — | — | — | 1.5 | |
| 3362 METHYL FURFURYL DISULFIDE | 1 | 1 | 2 | 2 | 1 | — | 1 | — | — | |
| 3363 6-METHYL-3,5-HEPTADIEN-2-ONE | 0.05 | 0.10 | 0.15 | 0.30 | 0.05 | — | — | 0.05 | — | |
| 3364 METHYL 3-HEXENOATE | 2 | 2 | 4 | 4 | 2 | — | — | — | — | Preserves & Spreads—2 |
| 3365 5-METHYL-5-HEXEN-2-ONE | 0.12 | 0.25 | 0.40 | 0.75 | 0.25 | — | — | 0.12 | — | |
| 3366 2-METHYL-4-(METHYLTHIO) FURAN | — | — | — | 1.5 | — | — | 1.5 | — | — | |
| 3367 METHYL CIS-4-OCTENOATE | 2 | 2 | 4 | 4 | 2 | — | — | — | — | Preserves—2 |

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|--|-----------|-----------------------|-------|-------------|---------------------|-------------|--------------------------|----------------------|---------------------|---|
| 3368 4-METHYL-3-PENTEN-2-ONE | — | 0.75 | 1.12 | 2.25 | 0.50 | — | — | 0.40 | — | |
| 3369 2-METHYLPROPYL 3-METHYLBUTYRATE | 5 | 5 | 8 | 8 | 5 | — | — | — | — | Preserves & Spreads—5 |
| 3370 2-(2-METHYLPROPYL) PYRIDINE | — | — | — | — | — | — | 0.2 | — | 0.5 | |
| 3371 3-(2-METHYLPROPYL) PYRIDINE | 0.1 | 0.2 | 0.5 | 1.0 | 0.3 | — | — | — | — | Cereals—1 |
| 3372 2-(1-METHYLPROPYL) THIAZOLE | — | 0.1 | 0.5 | 0.5 | 0.1 | — | 0.2 | — | 0.5 | |
| 3373 2-METHYLTETRAHYDROFURAN-3-ONE | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | Cereals—10 |
| 3374 3-METHYLTHIOBUTANAL | — | — | — | — | — | — | — | — | 2 | Vegetables—2 |
| 3375 4-METHYLTHIO-2-BUTANONE 3-Methylthiobutyraldehyde (see 3374) 2-Methyl-5-thiomethylfuran (see 3366) | 1 | 1 | 2 | 2 | 1 | — | 1 | — | — | |
| 3376 4-METHYLTHIO-4-METHYL-2-PENTANONE Methyl undecyl ketone (see 3388) | 1 | 1 | 2 | 2 | 1 | — | 1 | — | — | |
| 3377 NONA-2-TRANS, 6-CIS-DIENAL | — | — | — | — | — | — | — | — | 1 | Spreads & Preserves—1 |
| 3378 2,6-NONADIENAL DIETHYL ACETAL Δ-Nonalactone (see 3356) | — | 0.1 | 0.1 | — | — | — | 0.1 | — | 0.1 | |
| 3379 TRANS-2-NONEN-1-OL Oenanthic acid (see 3348) | 0.15 | 0.15 | 0.2 | 0.2 | 0.15 | — | 0.15 | — | — | |
| 3380 9,12-OCTADECADIENOIC ACID (48%) and 9,12,15-OCTADECATRIENOIC ACID (52%) | 15 | 15 | 15 | 15 | 15 | — | — | — | 15 | Preserves & Spreads—15; Alcoholic Beverages—15 |
| 3381 3-OXOBUTANAL, DIMETHYL ACETAL | — | 80 | 80 | 160 | 80 | — | 2000 | — | 500 | Preserves & Spreads—80; Vegetables—2000 |
| 3382 1-PENTEN-3-ONE | 5 | 5 | 8 | 8 | 5 | — | — | 0.005 | 0.01 | Preserves—5 |
| 3383 2-PENTYLPYRIDINE | — | 0.1 | 0.5 | 1 | 0.1 | — | 0.5 | — | 0.4 | |
| 3384 PHENYLACETALDEHYDE DIISOBUTYL ACETAL Propionic acid, thioacrylic (see 3329) | 10 | 30 | 75 | 50 | 50 | — | — | — | — | Alcoholic Beverages—25 |
| 3385 PROPYL THIOACETATE | 1 | — | — | 1 | — | — | 1 | — | 1 | Cereals—1 |
| 3386 PYRROLE Safranal (see 3389) Thienyl pyrimidine (see 3338) p-Tolyl isovalerate (see 3338) | — | 3 | 3 | 3 | 3 | — | 3 | — | — | Cereals—3 |
| 3387 P-TOLYL 3-METHYLBUTYRATE | 1 | 1 | 1 | 2 | 1 | — | — | — | — | |
| 3388 2-TRIDECANONE | — | 3 | 3 | 5 | 3 | — | — | — | — | Margarine—3 |
| 3389 2,6,6-TRIMETHYLCYCLOHEXA-1,3-DIENYL METHANAL | — | — | 5 | 10 | — | — | — | — | 5 | Preserves & Spreads—10 |
| 3390 1,3,3-TRIMETHYL-2-NORBORNANYL ACETATE | 0.2 | 0.2 | 0.3 | 0.3 | 0.2 | — | — | — | — | Preserves & Spreads—0.2 |